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(54) **SYSTEM AND METHOD FOR SEALING ROADWAY JOINTS**

(76) Inventors: **Richard James Anaya**, P.O. Box 758, Sabana Seca, PR (US) 00952; **James Beaubien**, P.O. Box 758, Sabana Seca, PR (US) 00952

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(52) **U.S. Cl.** **404/68**; 404/69; 404/74; 14/73.1
(58) **Field of Search** 14/73.1; 404/47, 404/48, 56, 67, 68, 69, 72, 75, 74

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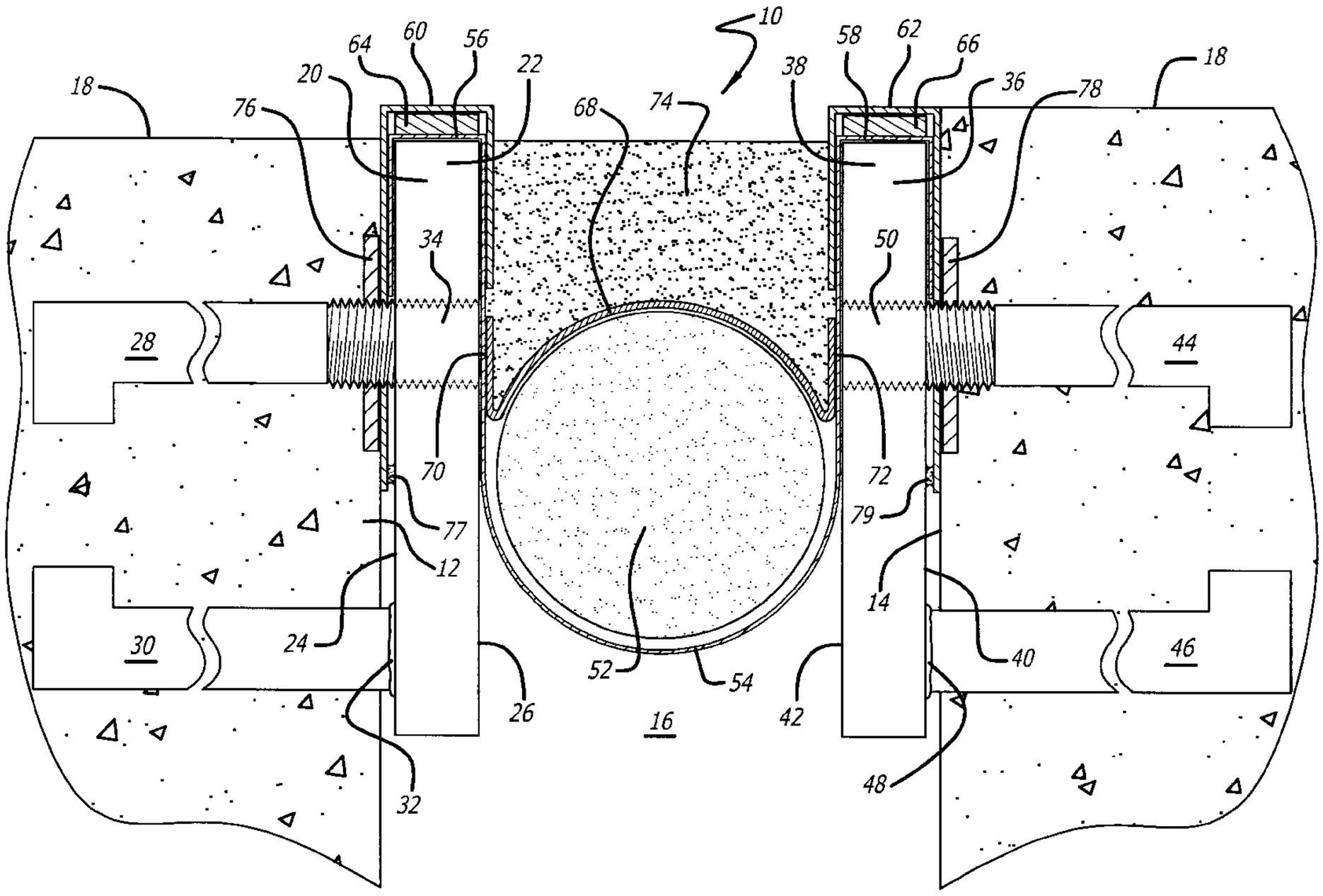
Primary Examiner—Gary S. Hartmann
(74) *Attorney, Agent, or Firm*—Shapiro & Dupont LLP

(57) **ABSTRACT**

A system for sealing joints in roadways wherein nose plates are attached to each side of the joint to form a gap between the nose plates. A lower seal element is located in the gap between the nose plates. A vapor barrier is provided that extends between the top portions of the two nose plates. The vapor barrier includes edges that are attached to the tops of the nose plates utilizing anchor caps. An upper seal may be included that is located on top of the lower seal element. The upper seal is formed by applying a liquid sealant over the lower seal element and vapor barrier or by installing a preformed gasket that is anchored to the nose plates using the anchor caps.

23 Claims, 4 Drawing Sheets



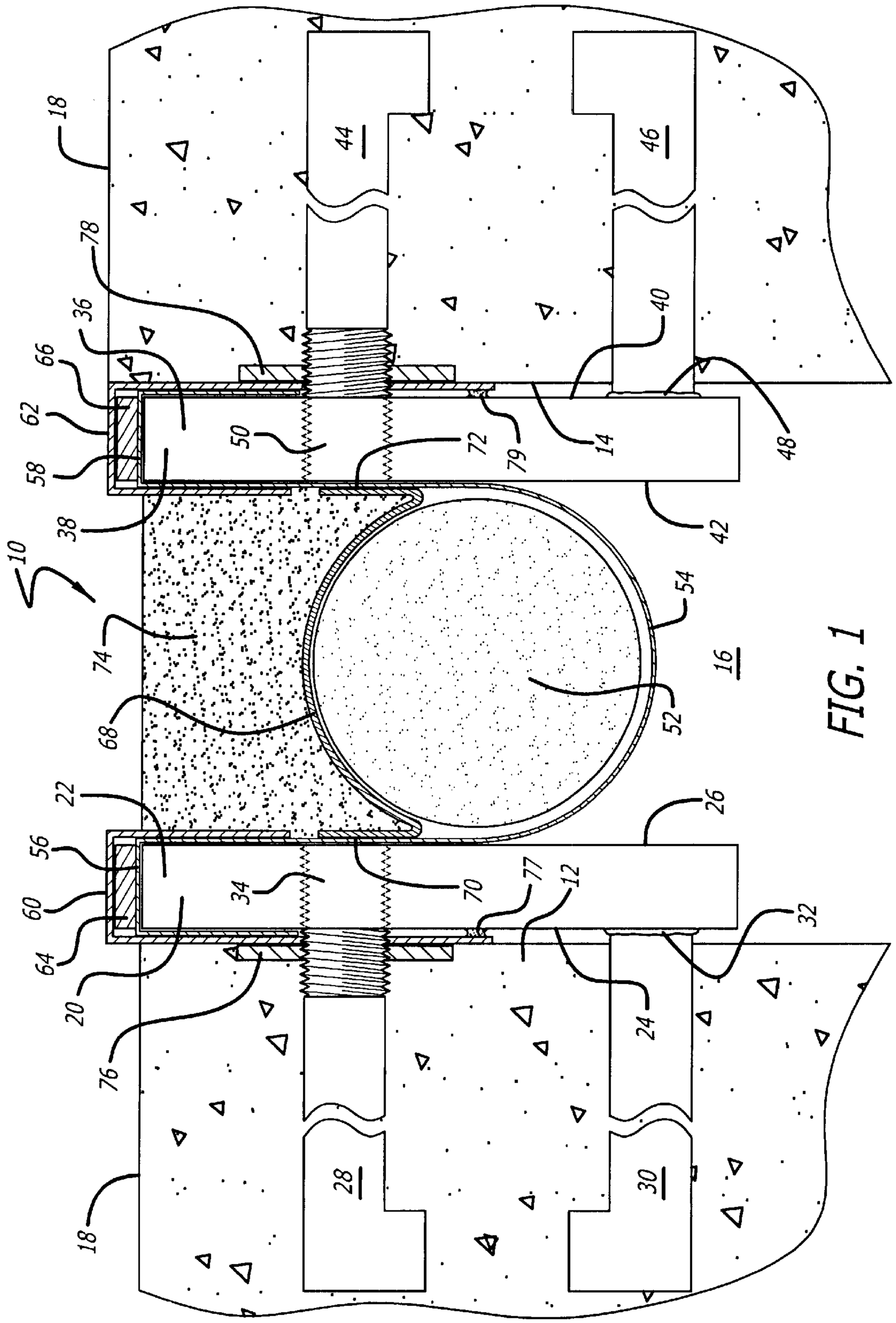

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FIG. 1

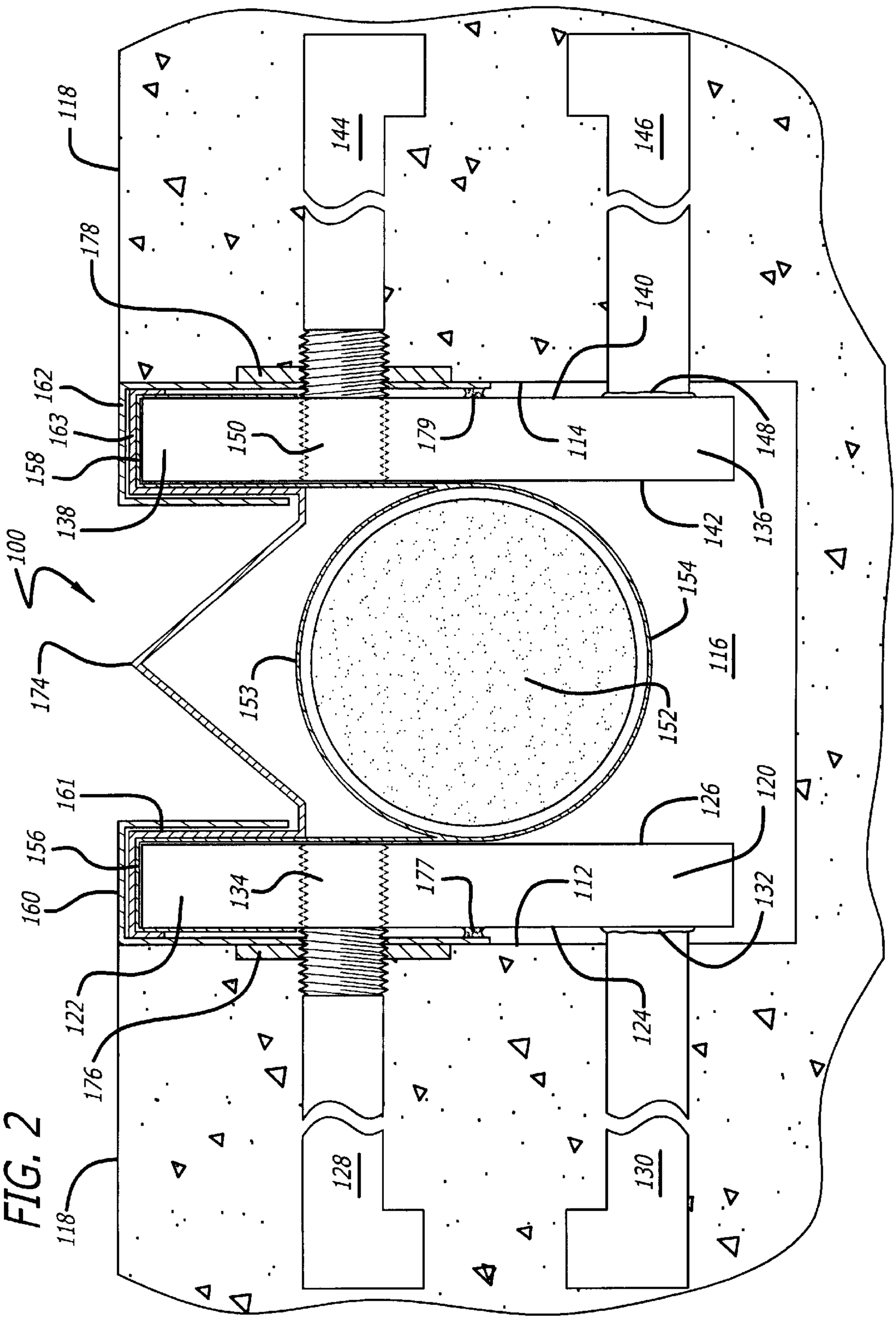
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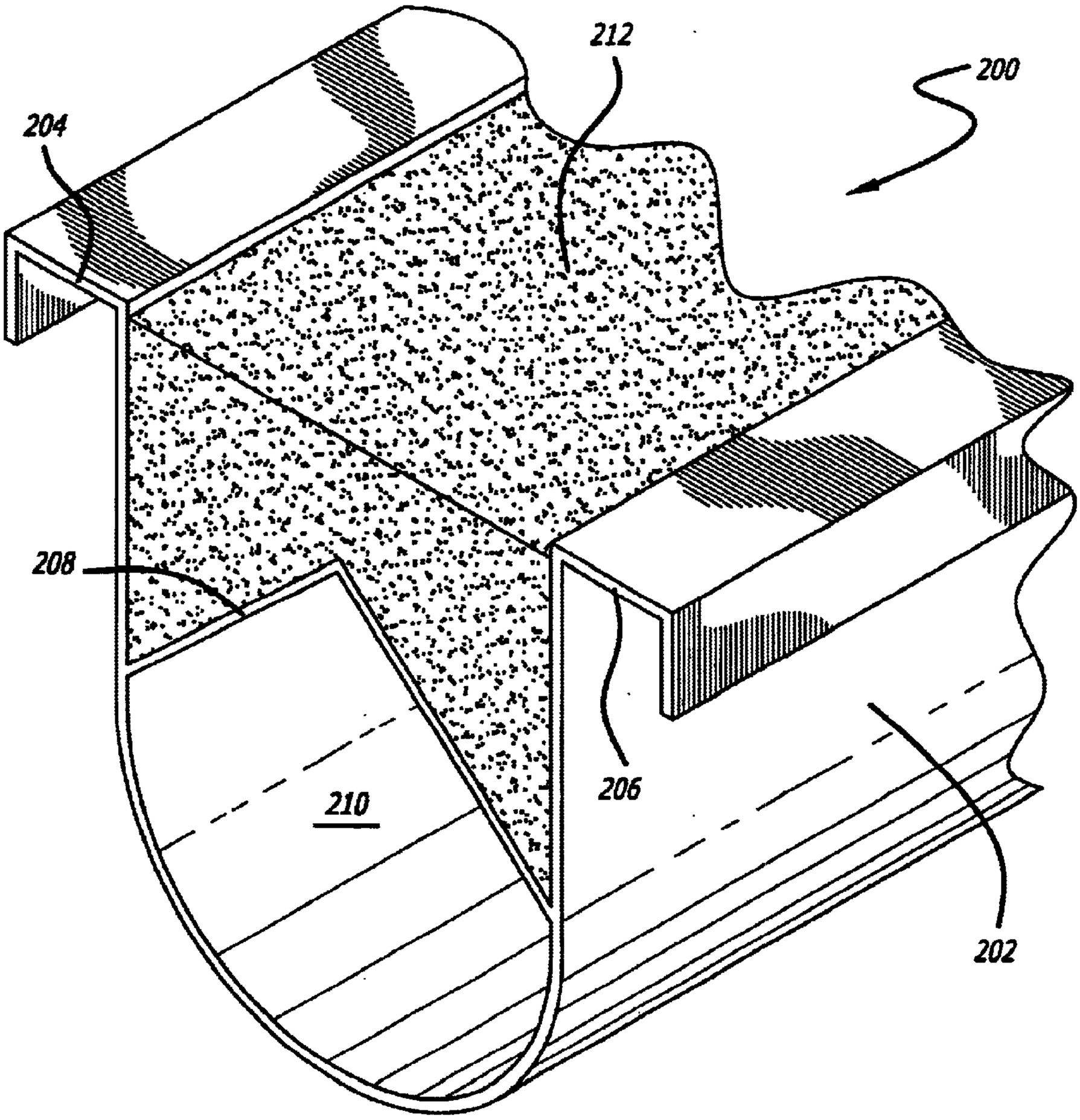
FIG. 2

FIG. 3



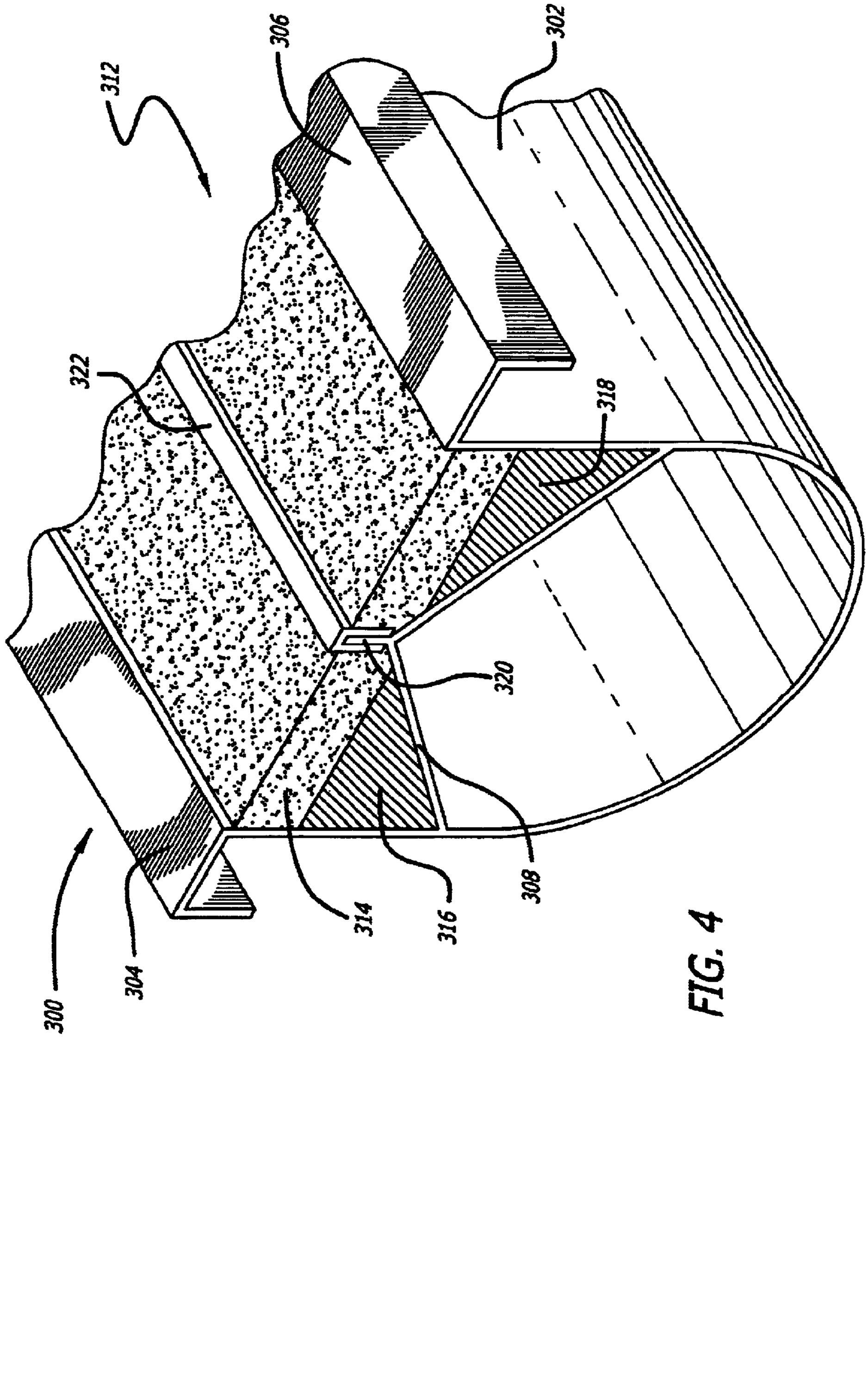


FIG. 4

SYSTEM AND METHOD FOR SEALING ROADWAY JOINTS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to systems and methods for sealing joints in large structures such as roadways. More particularly, the present invention is directed to providing seals in roadway joints that are resistant to water penetration over relatively long periods of time.

2. Description of Related Art

Roadways come in many different sizes and shapes. Roadways may be located directly on land or they can take the form of bridges that extend over water or other non-aqueous features. Roadways are typically made from a wide variety of materials including asphalt, concrete and metal. In many situations it is necessary to form a lateral gap or joint in the roadway to allow for independent movement of the adjacent roadway sections. Such movement is caused by many factors including expansion and contraction of the adjacent roadway sections due to changes in temperature. Roadway gaps or joints are especially critical in elevated structures such as bridges and parking garages. Relative movement of the roadway sections tends to be greater for elevated structures than for roadways located on land. In addition, temperature induced expansion and contraction is more of a problem for elevated structures because temperature fluctuations tend to be more rapid and of a greater magnitude than for roadways located on land.

A multitude of seal systems and configurations have been used to seal roadway joints. Seal systems vary depending upon the roadway type and the size of the joint being sealed. One popular technique involves pressing a flexible rod or tube into the joint. The remainder of the joint above the tube is then filled in with a sealant of some type. The rods or tubes are typically made from some type of foam material and are commonly referred to as "backer rods". Other types of seal systems utilize flexible gaskets and combinations of gaskets with sealants and structural reinforcements to provide sealing of the roadway joint. Examples of a variety of sealing systems that have been proposed for sealing joints in roadways are set forth in the following U.S. Pat. Nos.: 3,951,562; 4,245,925; 4,305,680; 4,367,976; 4,374,442; 4,447,172; 4,824,283; 4,927,291; 5,007,765; 5,026,609; 5,071,282; 5,168,683; 5,190,395; 5,607,253; 5,649,784; 5,664,906; 5,935,695; and 6,039,503.

The goal of any roadway joint seal system is to prevent water and other contaminants from entering the joint and to provide a durable surface over which vehicular traffic can pass. It is important that the seal be effective over relatively long periods of time and that it function properly even when exposed to extreme weather conditions. A major problem with many roadway joint seals is that they start to leak after relatively short periods of time. This is a particular problem in high moisture environments where the seal is exposed to water on a continual basis. Water entering the joint can cause relatively rapid deterioration of the roadway surrounding the joint. This is especially a problem in steel reinforced roadways where corrosion of the steel reinforcing material can seriously weaken the joint.

There presently are many types of seal systems that provide adequate sealing of roadway joints. Even so, there still is a continuing need to provide new sealing systems that are effective in protecting roadway joints over relatively long periods of time. Such sealing systems should be suitable for use in sealing new roadway joints. They also should be suitable for use in replacing existing seals in roadway joints that have deteriorated or otherwise failed.

SUMMARY OF THE INVENTION

In accordance with the present invention, systems and methods are provided for sealing roadway joints. The term "roadway joints" as used herein is intended to encompass all types of joints present in any structure that is intended to accommodate vehicular traffic. Roadway joints include all types of joints, including expansion joints that are present in concrete and asphalt highways located directly on land as well as elevated structures, such as bridges, parking garages, highway overpasses and the like.

The sealing system in accordance with the present invention is designed to seal joints in the roadway wherein the joint has a first wall and a second wall that define a space between the walls. The system includes a first nose plate that is attached to the first wall of the joint to be sealed. A second nose plate is attached to the second wall of the joint. Once attached, the first and second nose plates define a gap between the two interior walls of the nose plates. A lower seal element is located in the gap between the interior walls of the nose plates. A vapor barrier is provided that extends between the top portions of the two nose plates. The vapor barrier includes a first edge portion that is attached to the top of the first nose plate, and a second edge portion that is attached to the top of the second nose plate. Two anchor caps are provided which are used to anchor the edge portions of the vapor barrier to the tops of the nose plates. The combination of vapor barrier and anchoring caps provides a water-tight seal which is especially effective in preventing moisture from entering the joint over relatively long periods of time.

The sealing system in accordance with the present invention as described above may further include an upper seal that is located above the lower seal element and extends between the top portions of the two nose plates. Depending upon the size of the gap between the two nose plates, the upper seal may be formed from a curable liquid sealant or a preformed gasket.

The present invention also includes methods for sealing joints in roadways. The methods involve attaching nose plates to opposing sides of the joint such that the interior walls of the installed nose plates define a gap between the two plates. A lower seal element is then installed in the gap between the two nose plates. The vapor barrier is then installed and anchored to the top of the nose plates utilizing anchoring caps that are designed to clamp the vapor barrier to the nose plates. The method may further include the step of installing an upper seal located above the lower seal element wherein the upper seal extends between the top portions of the nose plates. Again, depending upon the size of the gap, the upper seal may be formed by applying a sufficient amount of a sealant to the gap to provide a sealant body that extends between the anchor caps located on the nose plates or the upper seal can be a preformed gasket that is installed into the gap and anchored to the nose plates using the anchor caps.

The above described system and method for sealing roadway joints may be used in new construction or to replace existing seals that have deteriorated or otherwise failed. The present invention is especially useful in sealing joints in elevated roadways such as bridges, parking garages and overpasses. The system is useful in high moisture environments, such as the tropics, where it is important to maintain a watertight seal.

The above described and many other features and attendant advantages of the present invention will become better understood by reference to the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side view a first preferred exemplary system for sealing a joint in a roadway in accordance with the present invention. The system is preferably used for sealing joints that are three inches or less in width.

FIG. **2** is a side view of a second preferred exemplary system for sealing a joint in a roadway in accordance with the present invention. This preferred system is designed for use in sealing roadway joints that are equal to or larger than three inches.

FIG. **3** is a perspective view of a first alternate exemplary preferred combined seal element and vapor barrier configuration for sealing joints that are three inches or less in width.

FIG. **4** is a perspective view of a second alternate exemplary preferred combined seal element and vapor barrier configuration for sealing joints that are equal to or larger than three inches in width.

DETAILED DESCRIPTION OF THE INVENTION

The present invention involves systems and methods for sealing roadway joints. As previously mentioned, the present invention is applicable to all types of roadway joints that require sealing. A preferred exemplary sealing system in accordance with the present invention is shown generally at **10** in FIG. **1**. The joint to be sealed includes a first wall **12** and a second wall **14** that define a space **16** between the first and second walls **12** and **14** that require sealing. The joint is located in roadway **18**. The roadway is preferably composed of concrete that is reinforced with steel. However, the roadway may be made from any of the other common roadway materials including asphalt.

The sealing system **10** includes a first nose plate **20** that includes a top portion **22**, an exterior wall **24**, and an interior wall **26**. The first nose plate **20** is preferably attached to the joint wall **12** by way of anchoring bolts **28** and **30**. The lower anchoring bolt **30** is securely embedded in the roadway **18** and is attached to the first nose plate **20** by welding as shown at **32**. Other connection types are possible including threaded engagement. The top anchor bolt **28** is also securely embedded within the roadway **18** and anchored to the first top plate **20** by a threaded engagement as represented in phantom at **34**.

The sealing system further includes a second nose plate **36** that also includes a top portion **38**, an exterior wall **40**, and an interior wall **42**. The second nose plate **36** is also attached to the roadway **18** utilizing anchor bolts **44** and **46**. The lower anchor bolt **46** is embedded securely in roadway **18** and connected to the exterior wall **40** of the second nose plate **36** by way of weld **48**. The top anchor bolt **44** is attached to the second nose plate **36** by way of a threaded engagement as shown in phantom at **50**. The two nose plates **20** and **36** are preferably made from corrosion resistant steel and/or the surfaces are treated to provide protection against corrosion. The nose plates **20** and **36** are preferably about ½ inch thick. However, thicker or thinner nose plates may be used depending upon the size of the joint being sealed. The vertical width of the nose plates **20** and **36** is preferably from 1 inch to 3 inches and may be varied depending again upon the size of the joint to be sealed. The nose plates **20** and **36** are preferably supplied in 10-foot lengths for easy handling and installation while at the same time limiting the number of lateral joints that are required in the roadway seal. Of course, shorter or longer nose plates may be used.

A lower seal element **52** is located in the gap between the interior walls **26** and **42** of the nose plates. The lower seal element **52** is preferably in the form of a backer rod. Backer rods are well known and commonly used in sealing roadway joints. Backer rods are typically made from open or closed cell foam and are well known in the art. Any of the known backer rod types may be used to form the lower seal element **52**. Open cell foam backer rods are preferred.

The seal element **10** further includes a vapor barrier **54** that extends up and over the first nose plate **20** as shown at **56**. The vapor barrier **54** also extends up and over the second nose plate **36** as shown at **58**. A first anchor cap **60** is provided for clamping the edge portion of the vapor barrier **54** to the top portion of the nose plate **22**. A second anchor cap **62** is provided for clamping the second edge portion of the vapor barrier **54** to the top portion **38** of the second nose plate **36**. The anchor caps **60** and **62** are preferably made from steel or other structurally strong material, such as high strength plastic. Composite materials that are made from fabric that is embedded in a resin matrix may also be used. Such composites include fiberglass and resin impregnated carbon fiber. Gaskets **64** and **66** are placed under the anchor caps **60** and **62**, respectively, in order to provide a cushion between the anchor caps, nose plates and the vapor barrier **54**. The gasket is preferably made from a flexible elastomer such as rubber.

The vapor barrier **54** may be made from any suitable material that is moisture impermeable. Suitable vapor barrier materials include rubber, plastics, and woven fabrics impregnated with rubber or plastic materials. A vapor barrier is preferably from 0.001 inch to 0.100 inch thick. Preferred vapor barrier materials are made from rubber or thermoplastic polymers that may be heat welded to other materials.

The seal system **10** also includes an upper membrane **68** that is thermally welded or glued to vapor barrier **54** at locations **70** and **72**. The upper membrane is preferably made from the same types of materials that are used to form the vapor barrier **54**. The upper membrane **68** is optional, but is preferred. The space on top of upper membrane **68** is preferably sealed with an upper seal **74**. The upper seal **74** is formed by filling the gap on top of upper membrane **68** with a suitable sealant. Any number of the well-known sealants typically used in sealing roadway joints may be utilized. The sealants are typically liquid during application and cure to form a final seal element **74**. Exemplary sealants that are commercially available include Dow **902** which is available from Dow Corning (Midland, Mich.) and THC 9000 which is available from Tremco (Beachwood, Ohio).

The anchor caps **60** and **62** preferably fit relatively tightly over the nose plates **20** and **36**, vapor barrier **54** and gaskets **64** and **66**. It is preferred that the anchor caps **60** and **62** be held in place utilizing washers **76** and **78**, respectively. The washers **76** and **78** are threaded on anchor bolts **28** and **44**, respectively, so that they may be tightened down against the outer side of the anchoring caps to hold them firmly in place. The lower portion of the anchor caps may be welded to the nose plates as shown at **77** and **79** to provide further attachment of the anchor caps to the nose plates. The welds **77** and **79** may be continuous along the length of the nose plates or they may be spot welds.

In FIG. **1**, the seal system **10** is shown from the side. The length of the backer rod **52**, nose plates **20** and **36** will vary

depending upon the length of the joint to be sealed. As previously mentioned, the nose plates are preferably provided in 10-foot lengths. For roadway joints longer than 10 feet, multiple lengths are required. The backer rods, membranes and gaskets may also be provided in matching 10-foot lengths. At the junction of each length, the nose plates are welded together and the backer rod, membrane and gaskets are either thermally welded or glued together using splices. The backer rod, membrane and gaskets may be provided in longer lengths to reduce the number of joints that are required. The upper seal element **74** is formed last by application of the liquid sealant to the entire length of the joint. The sealing system **10** is preferably used for sealing joints in bridges, parking garages and other elevated roadways wherein the distance between the first and second joint walls **12** and **14** is three inches or less.

A second preferred exemplary seal system in accordance with the present invention is shown at **100** in FIG. **2**. The seal **100** is designed for use in sealing joints that are three inches or wider. The sealing system **100** is basically the same as sealing system **10** except that the liquid curable seal **74** in FIG. **1** is replaced with a preformed gasket **174**. Referring to FIG. **2**, the joint to be sealed includes a first wall **112** and a second wall **114** that define a space **116** between the first and second walls **112** and **114** that require sealing. The joint is located in roadway **118**. The roadway is preferably composed of concrete that is reinforced with steel. However, the roadway may be made from any of the other common roadway materials including asphalt.

The sealing system **100** includes a first nose plate **120** that includes a top portion **122**, an exterior wall **124**, and an interior wall **126**. The first nose plate **120** is preferably attached to the joint wall **112** by way of anchoring bolts **128** and **130**. The lower anchoring bolt **130** is securely embedded in the roadway **118** and is attached to the first nose plate **120** by welding as shown at **132**. Other connection types are possible including threaded engagement. The top anchor bolt **128** is also securely embedded within the roadway **118** and anchored to the first top plate **120** by a threaded engagement as represented in phantom at **134**.

The sealing system **100** further includes a second nose plate **136** that also includes a top portion **138**, an exterior wall **140**, and an interior wall **142**. The second nose plate **136** is also attached to the roadway **118** utilizing anchor bolts **144** and **146**. The lower anchor bolt **146** is embedded securely in roadway **118** and connected to the exterior wall **140** of the second nose plate **136** by way of weld **148**. The top anchor bolt **144** is attached to the second nose plate **136** by way of a threaded engagement as shown in phantom at **150**. The two nose plates **120** and **136** are preferably made from corrosion resistant steel and/or the surfaces are treated to provide protection against corrosion. The nose plates **120** and **136** are preferably about ½ inch thick. However, thicker or thinner nose plates may be used depending upon the size of the joint being sealed. The vertical width of the nose plates **120** and **136** is preferably from 1 inch to 3 inches and may be varied depending again upon the size of the joint to be sealed. The nose plates **120** and **136** are preferably supplied in 10-foot lengths for easy handling and installation while at the same time limiting the number of lateral joints that are required in the roadway seal. Of course, shorter or longer nose plates may be used.

A lower seal element **152** is located in the gap between the interior walls **126** and **142** of the nose plates. The lower seal element **152** is preferably a backer rod of the same type as backer rod **52** that has been previously described.

The seal element **100** further includes a vapor barrier **154** that extends up and over the first nose plate **120** as shown at **156**. The vapor barrier **154** also extends up and over the second nose plate **136** as shown at **158**. It is preferred that the vapor barrier **154** is wrapped completely around the backer rod **152** as shown at **153** and thermally or chemically welded together. Optionally, the vapor barrier may be placed under the backer rod and attached to the nose plates to form a moisture impermeable trough in which the backer rod sits.

A first anchor cap **160** is provided for clamping the edge portion of the vapor barrier **154** to the top portion of the nose plate **122**. A second anchor cap **162** is provided for clamping the second edge portion of the vapor barrier **154** to the top portion **138** of the second nose plate **136**. The anchor caps **160** and **162** are preferably made from the same materials as the previously described anchor caps.

A preformed gasket **174** is used in place of a liquid sealant to provide sealing of the gap above the backer rod **152**. The gasket **174** is shaped so that it can be clamped under the anchor caps **160** and **162** as shown at **161** and **163**, respectively. The gasket **174** may be made from any of the known gasket materials that are designed for use in exterior applications. These gasket materials include various types of rubbers and synthetic polymers that are compounded with various additives commonly used to control the gasket properties and increase the resistance of the material to weathering. Such additives include UV absorbers, plasticizers and fillers that are used to control the stiffness and flexibility of the material.

The anchor caps **160** and **162** preferably fit relatively tightly over the nose plates **120** and **136**, vapor barrier **154** and gasket **174**. As was the case in the previously described embodiment, it is preferred that the anchor caps **160** and **162** be held in place utilizing washers **176** and **178**, respectively. The washers **176** and **178** are threaded on anchor bolts **128** and **130**, respectively, so that they may be tightened down against the outer side of the anchoring caps to hold them firmly in place. A threaded nut and standard non-threaded washer may be used instead of a threaded washer, if desired. The lower portion of the anchor caps may be welded to the nose plates as shown at **177** and **179** to provide further attachment of the anchor caps to the nose plates. The welds **177** and **179** may be continuous along the length of the nose plates or they may be spot welds.

The two exemplary sealing systems described above may be used to seal joints in a wide variety of roadways. However, these sealing systems are especially well suited for sealing joints in elevated roadway structures, such as bridges, overpasses and multi-story garages. In addition, the sealing systems are preferably intended for use in locations where the roadway joint is subjected to relatively constant exposure to rain and other forms of moisture.

The method for installing the sealing systems involves installing the nose plates to either side of the roadway joint using the anchor bolts. The anchor bolts are spaced a sufficient distance apart to provide adequate anchoring of the nose plates. The anchor bolt spacing may be varied depending upon the type of roadway material being sealed. The nose plates and anchors are preferably first put in place and then concrete or asphalt is added to form a tight seal against the outside of the nose plates. A suitable sealant or bonding agent is preferably applied to the exterior walls of nose plates to ensure a watertight seal between the nose plates and the surrounding roadway. Once the nose plates are in position, the backer rod and membrane are installed. For sealing systems of the type shown in FIG. **1**, the optional upper membrane **153** is welded in place. Then, the anchor caps and cushioning gaskets are installed followed by appli-

cation of the liquid sealant to seal the gap above the backer rod. For sealing systems of the type shown in FIG. **2**, the membrane may be wrapped completely around the backer rod and welded together or simply passed under it to form a trough in which the backer rod sits. Either way, the membrane and the pre-molded gasket are attached to the nose plates using the anchoring caps. In both systems, the anchoring caps are secured by tightening the threaded washers or nut/washer combinations to clamp the anchoring caps against the nose plate. The anchoring caps are further secured by welding to the nose plates.

An alternate preferred sealing configuration is shown at **200** in FIG. **3**. The nose plates and anchor caps are not shown for simplicity. The seal **200** is preferably used to seal joints that are less than three inches in width. The seal **200** includes a molded rubber element **202** that has arms or edge portions **204** and **206** that fit snugly over the tops of the nose plates. The walls of the molded rubber element **202** are preferably about ⅛ inch thick. The seal **200** functions both as a lower seal element and a vapor barrier. The seal is generally "U" shaped and includes a transverse wall **208** that is peaked (as shown) or corrugated to allow for expansion of the seal **200**. The chamber **210** located below wall **208** is preferably hollow, but may be filled with a flexible foam, if desired. An upper seal **212** is provided using a liquid sealant that is poured into the space above the transverse wall **208** and allowed to cure. If desired, one or more backer rods (not shown) may be combined with the liquid sealant to form the upper seal **212**.

Another alternate preferred sealing configuration is shown at **300** in FIG. **4**. Again, the nose plates and anchor caps are not shown for simplicity. The seal **300** is preferably used to seal joints that are equal to or greater than three inches in width. The seal **300** includes a molded rubber element **302** that has arms or edge portions **304** and **306** that fit snugly over the tops of the nose plates. The walls of the molded rubber element **302** are preferably about 3/16 inch thick. The seal **300** functions both as a lower seal element and a vapor barrier. The seal is generally "U" shaped and includes a transverse wall **308** that is peaked (as shown) or corrugated to allow for expansion of the seal **300**. The chamber **310** located below wall **308** is preferably hollow, but may be filled with foam, if desired. An upper seal shown generally at **312** is formed from a sealant layer **314** that is placed on top of two triangular shaped backer rods **316** and **318**. The transverse wall **308** also includes a molded rubber ridge **320** onto which a metal cap **322** is either press fit or molded.

Having thus described exemplary embodiments of the present invention, it should be noted by those skilled in the art that the within disclosures are exemplary only and that various other alternatives, adaptations and modifications may be made within the scope of the present invention. Accordingly, the present invention is not limited to the above preferred embodiments and examples, but is only limited by the following claims.

What is claimed is:

1. A system for sealing a joint in a roadway wherein said joint includes a first wall and a second wall that define a space between said first and second walls that requires sealing, said system comprising:

a first nose plate comprising a top portion, an exterior wall attached to the first wall of said joint and an interior wall;

a second nose plate comprising a top portion, an exterior wall attached to the second wall of said joint and an interior wall, wherein the interior walls of said first and second nose plates define a gap between said interior walls;

a lower seal element located in said gap between the interior walls or said first and second nose plates;

a vapor barrier extending between the top portion of said first nose plate and the top portion of said second nose plate, said vapor barrier comprising a first edge portion attached to the top portion of said first nose plate and a second edge portion attached to the top portion of said second nose plate;

a first anchor cap having an interior surface for anchoring the first edge portion of said vapor barrier to the top portion of said first nose plate by clamping said first edge portion between the interior surface of said first anchor cap and the top portion of said first nose plate; and

a second anchor cap having an interior surface for anchoring the second edge portion of said vapor barrier to the top portion of said second nose plate by clamping said second edge portion between the interior surface of said second anchor cap and the top portion of said second nose plate.

2. A system for sealing a joint in a roadway according to claim **1** wherein said lower seal element is a backer rod.

3. A system for sealing a joint in a roadway according to claim **2** wherein said backer rod is an open cell backer rod.

4. A system for sealing a joint in a roadway according to claim **1** wherein said lower seal element includes a top side and a bottom side and wherein said vapor barrier extends around the bottom side of said lower seal element.

5. A system for sealing a joint in a roadway according to claim **4** wherein said vapor barrier is wrapped completely surrounds said lower seal element.

6. A system for sealing a joint in a roadway according to claim **1** that further comprises an upper seal located above said lower seal element wherein said upper seal extends between the top portions of said first and second nose plates.

7. A system for sealing a joint in a roadway according to claim **6** wherein said upper seal comprises a sealant extending between said first and second anchor caps.

8. A system for sealing a joint in a roadway according to claim **6** wherein said upper seal comprises a gasket extending between the top portions of said first and second nose plates and wherein said gasket comprises a first edge portion that is anchored to said first nose plate by said first anchor cap and a second edge portion that is anchored to said second nose plate by said second anchor cap.

9. A system for sealing a joint in a roadway according to claim **1** wherein a first flexible gasket is located between said first anchor cap and said vapor barrier and a second flexible gasket is located between said second anchor cap and said vapor barrier.

10. A system for sealing a joint in a roadway according to claim **9** wherein said first and second flexible gaskets comprise an elastomer.

11. A system for sealing a joint in a roadway according to claim **1** wherein said first and second nose plates comprise a metal.

12. A system for sealing a joint in a roadway according to claim **1** that further comprises a first attachment system for attaching the exterior wall of said first nose plate to the first wall of said joint and a second attachment system for attaching the exterior wall of said second nose plate to the second wall of said joint.

13. A system for sealing joints in a roadway according to claim **1** wherein said roadway is located on a bridge.

14. A method for sealing a joint in a roadway comprising the steps of:

providing a joint wherein said joint includes a first wall and a second wall that define a space between said first and second walls that requires sealing;

attaching a first nose plate to the first wall of said joint, said first nose plate comprising a top portion, an exterior wall that is attached to the first wall of said joint and an interior wall;

attaching a second nose plate to the second wall of said joint, said second nose plate comprising a top portion, an exterior wall that is attached to the second wall of said joint and an interior wall, wherein the interior walls of said first and second nose plates define a gap between said interior walls when said first and second nose plates are attached to the first and second walls of said joint;

installing a lower seal element located in said gap between the interior walls or said first and second nose plates;

providing a vapor barrier extending between the top portion of said first nose plate and the top portion of said second nose plate, said vapor barrier comprising a first edge portion to be attached to the top portion of said first nose plate and a second edge portion to be attached to the top portion of said second nose plate;

anchoring the first edge of said vapor barrier to the top portion of said first nose plate using a first anchor cap having an interior surface for anchoring the first edge portion of said vapor barrier to the top portion of said first nose plate by clamping said first edge portion between the interior surface of said first anchor cap and the top portion of said first nose plate; and

anchoring the second edge of said vapor barrier to the top portion of said second nose plate using a second anchor cap having an interior surface for anchoring the second edge portion of said vapor barrier to the top portion of said second nose plate by clamping said second edge portion between the interior surface of said second anchor cap and the top portion of said second nose plate.

15. A method for sealing a joint in a roadway according to claim **14** wherein said lower seal element is a backer rod.

16. A method for sealing a joint in a roadway according to claim **15** wherein said backer rod is an open cell backer rod.

17. A method for sealing a joint in a roadway according to claim **14** wherein said lower seal element includes a top side and a bottom side and wherein said step of providing said vapor barrier comprises extending said vapor barrier around the bottom side of said lower seal element.

18. A method for sealing a joint in a roadway according to claim **17** wherein said step of providing said vapor barrier comprises wrapping said vapor barrier completely around the top and bottom sides of said lower seal element.

19. A method for sealing a joint in a roadway according to claim **14** that further comprises the step of installing an upper seal located above said lower seal element wherein said upper seal extends between the top portions of said first and second nose plates.

20. A method for sealing a joint in a roadway according to claim **19** wherein said step of installing said upper seal comprises applying a sufficient amount of a sealant to said gap to provide a sealant body extending between said first and second anchor caps above said lower seal element.

21. A method for sealing a joint in a roadway according to claim **19** wherein said step of installing said upper seal comprises installing a gasket extending between the top portions of said first and second nose plates, said gasket comprising a first edge portion that is anchored to said first nose plate using said first anchor cap and a second edge portion that is anchored to said second nose plate using said second anchor cap.

22. A method for sealing a joint in a roadway according to claim **14** wherein said first and second nose plates comprise a metal.

23. A method for sealing joints in a roadway according to claim **14** wherein said roadway is located on a bridge.

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